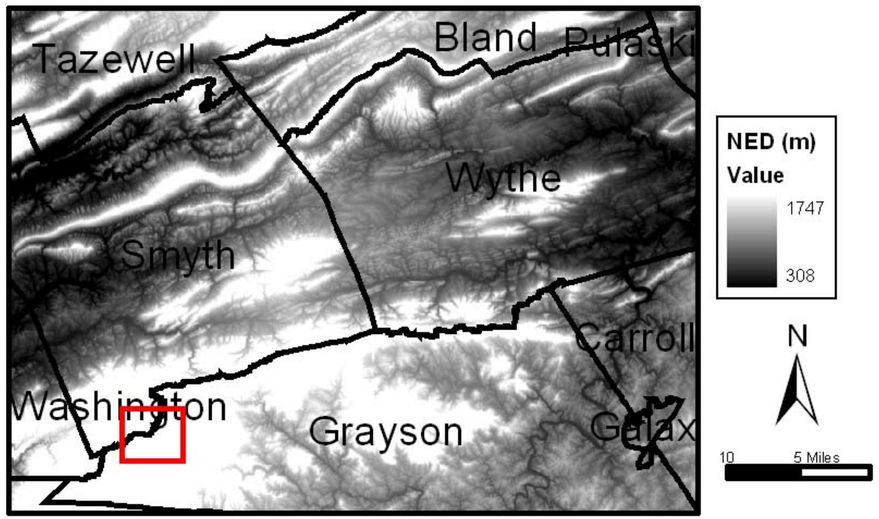
Digital Elevation Models



Elevation

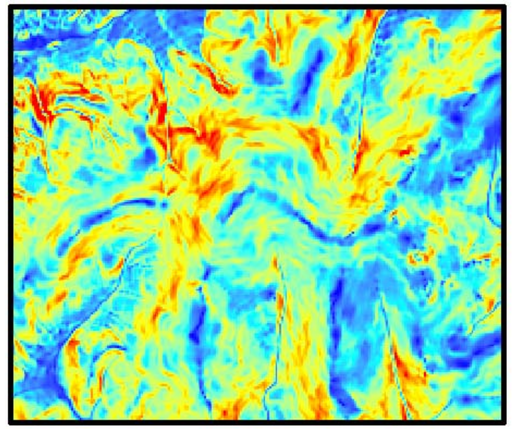
The United States Geological Survey's (USGS) National Elevation Dataset (NED) has been developed by merging the highest-resolution, best-quality elevation data available across the United States into a seamless raster format. In the Digital Elevation Model above, higher elevations are shown in white. Information can be derived from an elevation dataset including slope,aspect, contours and hill shading.

Slope can be determined based on elevation using a function that calculates the maximum rate of elevation change (defined as degree or percent) between each cell and its neighbors. The image to the right at top shows the results of running the the Slope function on the elevation dataset above bounded by the red inset area.

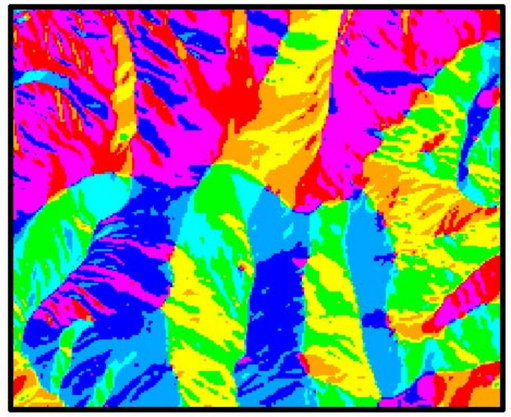
Aspect identifies the steepest downslope direction from each cell to its neighbors. It can be thought of as slope direction or the compass direction a hill faces. It is measured clockwise in degrees from 0 (due north) to 360 (again due north, coming full circle). The value of each cell in an aspect dataset indicates the compass direction the cell's slope faces. Flat slopes have no direction and are given a value of -1.

Contours are lines that connect points of equal value, in this case, elevation. The distribution of the contours shows how values change across a surface. Where there is little change in a value, the contours are spaced farther apart. Where the values rise or fall rapidly, the contours are closer together. This map shows the output elevation contour dataset. The areas where the contours are closer together indicate the steeper locations, which correspond to the red/orange areas in the slope image above.

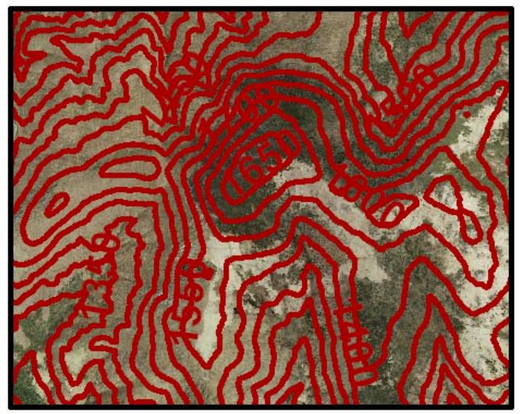
The Hillshade function obtains the hypothetical illumination of a surface by determining illumination values for each cell in a raster. It does this by setting a position for a hypothetical light source and calculating the illumination values of each cell in relation to neighboring cells based on topography. By default, shadow and light are shades of gray increasing from black to white. By placing an elevation raster on top of a hillshade (see top, far right), then making the elevation raster transparent, realistic images of the landscape can be created. Other images such as topographical maps (see bottom, far right) can be draped over hillshades to enhance variations in topography.



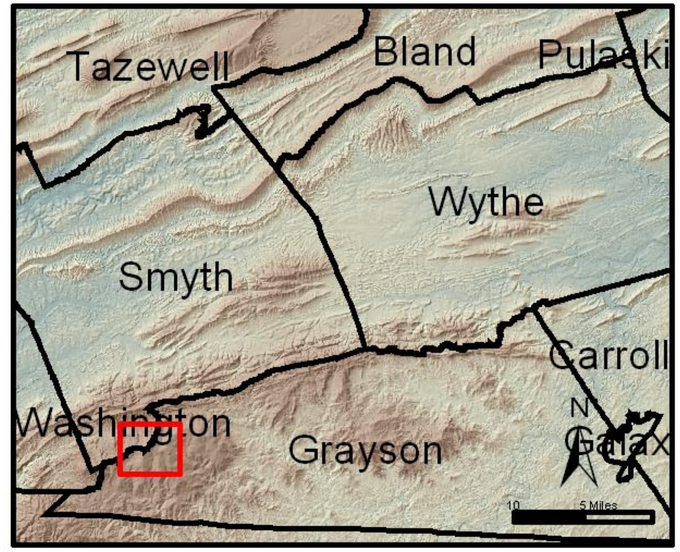
Slope



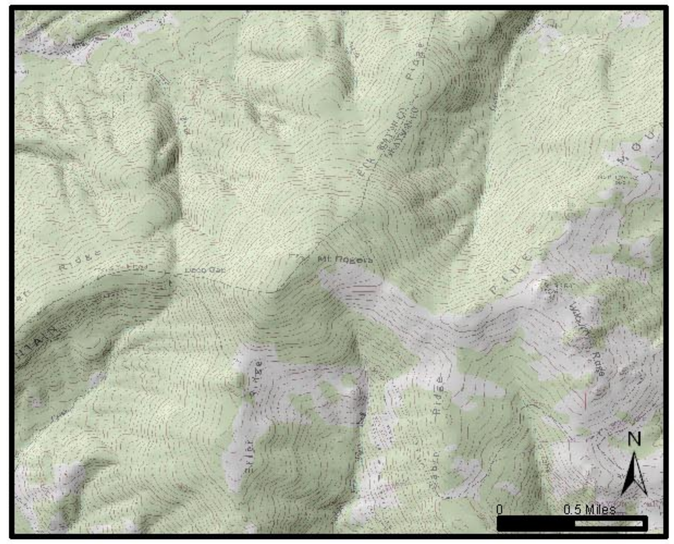
Aspect



Contours (50m)



Hillshade



USGS Topographical Map overlaid on Hillshade

Sources:
NED, Topo, NHD-USGS
Aerial Imagery © Commonwealth of Virginia
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